What is claimed is:

1. A pharmaceutical composition comprising a PARG inhibitor or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier; wherein the PARG inhibitor is present in an amount that is effective for treatment or prevention of a disease or condition resulting from cell damage or death.

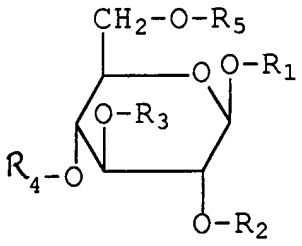
2. The pharmaceutical composition of claim 1 wherein said cell damage or death is due to necrosis, apoptosis, or combinations thereof.

3. The pharmaceutical composition of claim 1 wherein said disease or condition is selected from the group consisting of acute pain, arthritis, atherosclerosis, cachexia, cardiovascular disorders, chronic pain, degenerative diseases, diabetes, diseases or disorders relating to lifespan or proliferative capacity of cells, diseases or disease conditions induced or exacerbated by cellular senescence, head trauma, immune senescence, inflammatory bowel disorders, ischemia, macular degeneration, muscular dystrophy, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases,

neuronal mediated tissue damage or disease, neuropathic pain, nervous insult, osteoarthritis, osteoporosis, peripheral nerve injury, renal failure, retinal ischemia, septic shock, skin aging, and vascular stroke.

4. The pharmaceutical composition of claim 3 wherein said PARG inhibitor is selected from the group consisting of glucose derivatives; lignin glycosides; hydrolysable tannins; adenoside derivatives; acridine derivatives; tilorone analogs; daunomycin; ellipticine; and proflavine.

5. The pharmaceutical composition of claim 3 wherein said PARG inhibitor is a compound of formula I:



I

wherein:

R_1, R_2, R_3, R_4, R_5 individually represent a hydrogen atom or X,

X represents a carbonyl having a phenyl individually substituted by a plurality of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups,

provided that R_1-R_5 do not represent a hydrogen atom

simultaneously.

6. The pharmaceutical composition of claim 5, wherein X is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3,5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

7. The pharmaceutical composition of claim 6, wherein the compound of formula I is 1,2,3,4,6-penta-o-galloyl-d-glucopyranose, 1,2,3,4,6-penta-o-(3,5-dimethoxy-4-hydroxycinnamoyl)-d-glucopyranose, or 1,2,3,4,6-penta-o-(3,4,5-trimethoxycinnamoyl)-d-glucopyranose.

8. The pharmaceutical composition of claim 3, wherein said PARG inhibitor is a hydrolysable tannin.

9. The pharmaceutical composition of claim 8, wherein said hydrolysable tannin is selected from the group consisting of gallotannins and ellagitannins.

10. The pharmaceutical composition of claim 3, wherein said PARG inhibitor is a lignin glycoside.

11. The pharmaceutical composition of claim 10, wherein said lignin glycoside has the following properties:

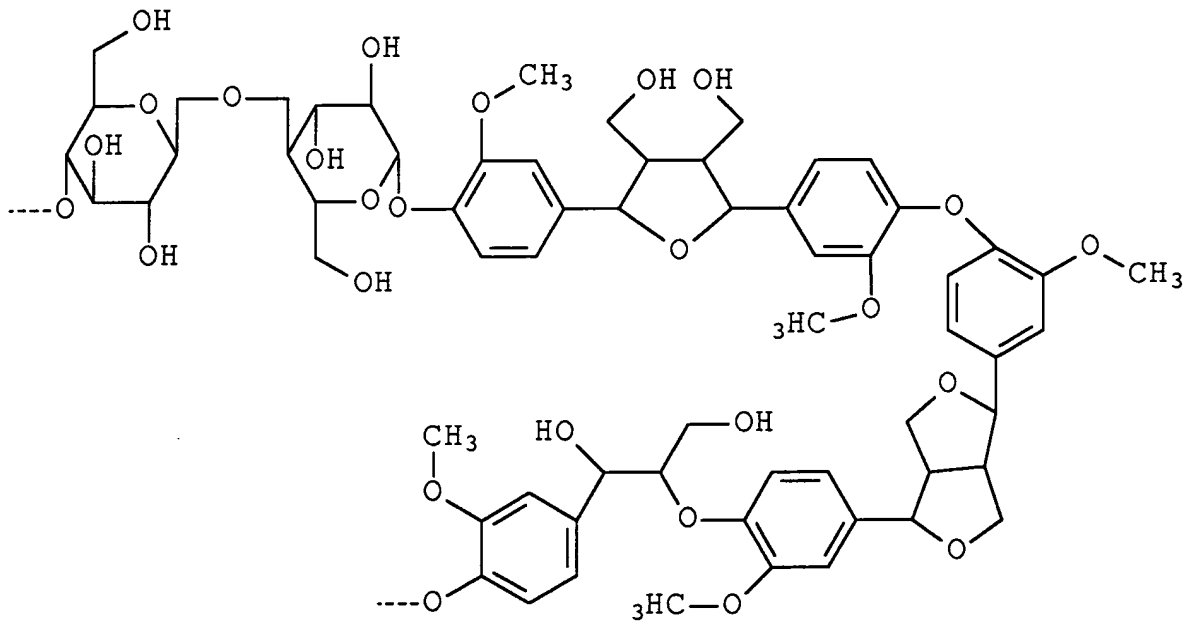
(i) tannin and polysaccharide are bonded;

(ii) the molecular weight is 500 to 140,000;

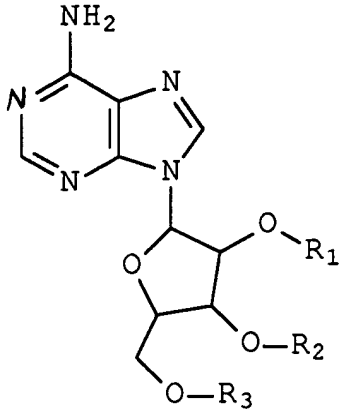
(iii) the bonding ratio of tannin to polysaccharide is 1:1 to 20:1, as a molecular ratio;

(iv) the polysaccharide is composed of 60 to 70% uronic acid, and 30 to 40% neutral sugar.

12. The pharmaceutical composition of claim 11, wherein the lignin glycoside comprises the following structure:



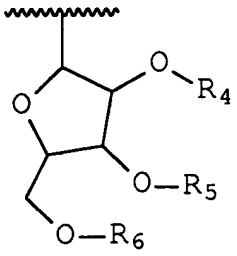
13. The pharmaceutical composition of claim 3, wherein said PARG inhibitor comprises a compound of formula II:



II

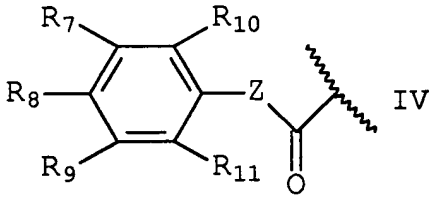
wherein:

R_1 represents a hydrogen atom, a group represented by formula III:



III

or X, wherein X is the compound of formula IV:



IV

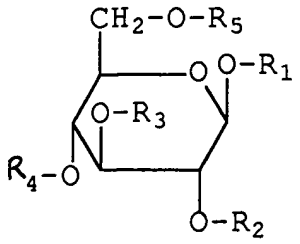
wherein Z is a bond, C_1-C_8 alkyl, or C_2-C_8 alkenyl; R_7, R_8, R_9, R_{10}, and R_{11} are independently selected from hydrogen, hydroxyl, or C_1-C_8 alkoxy, provided that R_7-R_{11} are not four or five hydrogen atoms simultaneously, and R_2, R_3, R_4, R_5, and R_6 independently represent a hydrogen atom or X, X

representing the same as that described above;
provided that R_1, R_2, and R_3 do not represent a hydrogen atom simultaneously;
and further provided that R_2, R_3, R_4, R_5, and R_6 do not represent a hydrogen atom simultaneously.

14. The pharmaceutical composition of claim 13, wherein X is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3, 5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

15. A pharmaceutical composition comprising a PARG inhibitor or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier; wherein the PARG inhibitor is present in an amount that is effective for inhibiting or decreasing free radical-induced cellular energy depletion.

16. A pharmaceutical composition comprising a compound of formula I:



I

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

wherein the compound of formula I is present in an amount that is effective for treatment or prevention of diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal muscle, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy, osteoarthritis, osteoporosis, neuropathic pain, nervous insult, peripheral nerve injury, renal failure, retinal ischemia, septic shock, and skin aging;

and wherein:

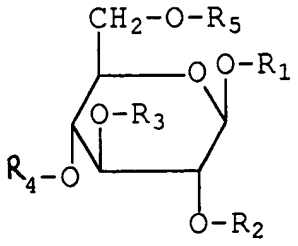
R_1, R_2, R_3, R_4, R_5 individually represent a hydrogen atom or A, A representing a carbonyl having a phenyl substituted by a plurality of groups selected from a group consisting of a

hydroxyl group and C_1-C_8 alkoxy groups, provided that R_1-R_5 do not represent a hydrogen atom simultaneously.

17. The pharmaceutical composition of claim 16, wherein A is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3, 5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

18. The pharmaceutical composition of claim 16, wherein the compound of formula I is 1,2,3,4,6-penta-o-galloyl-d-glucopyranose, 1,2,3,4,6-penta-o-(3,5-dimethoxy-4-hydroxycinnamoyl)-d-glucopyranose, or 1,2,3,4,6-penta-o-(3,4,5-trimethoxycinnamoyl)-d-glucopyranose.

19. A pharmaceutical composition comprising a compound of formula I:



I

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

wherein the compound of formula I is present in an amount that is effective for inhibiting or decreasing free radical-induced cellular energy depletion;

and wherein:

R_1, R_2, R_3, R_4, R_5 individually represent a hydrogen atom or A, A representing a carbonyl having a phenyl substituted by a plurality of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups, provided that R_1-R_5 do not represent a hydrogen atom simultaneously.

20. A pharmaceutical composition comprising a lignin glycoside or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

wherein the lignin glycoside is present in an amount that is effective for treatment or prevention of diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy,

osteoarthritis, osteoporosis, neuropathic pain, nervous insult, peripheral nerve injury, renal failure, retinal ischemia, septic shock, and skin aging;

and wherein:

the lignin glycoside has the following properties:

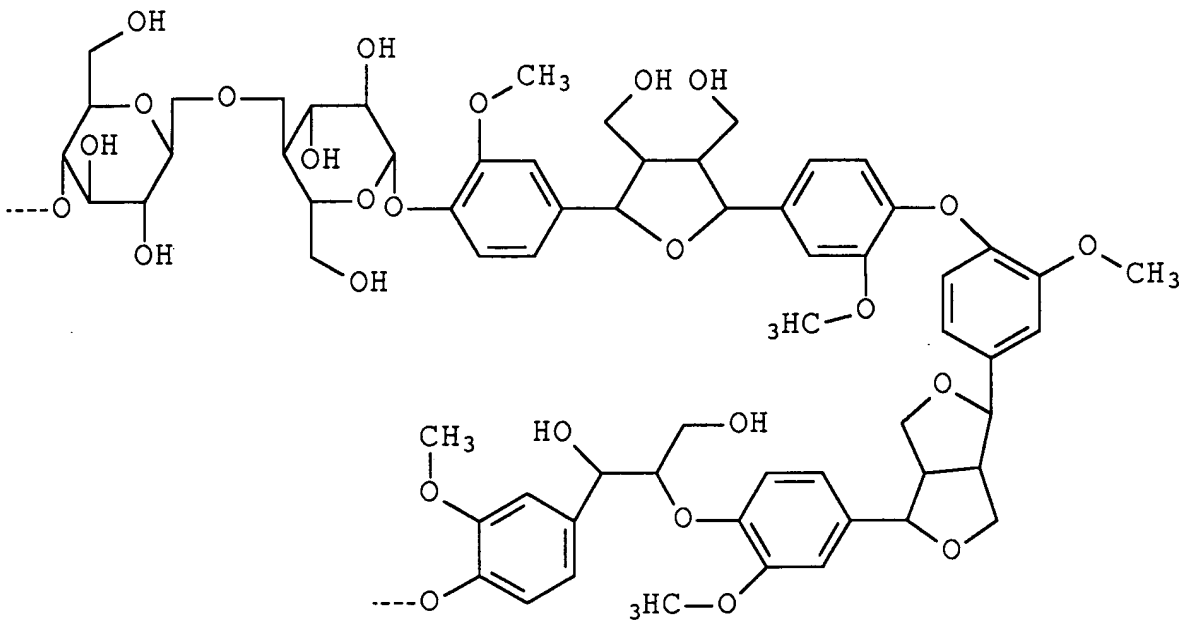
(i) tannin and polysaccharide are bonded;

(ii) the molecular weight is 500 to 140,000;

(iii) the bonding ratio of tannin to polysaccharide is 1:1 to 20:1, as a molecular ratio;

(iv) the polysaccharide is composed of 60 to 70% uronic acid, and 30 to 40% neutral sugar.

21. The pharmaceutical composition of claim 20, wherein the lignin glycoside comprises the following structure:



22. A pharmaceutical composition comprising a lignin glycoside or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

wherein the lignin glycoside is present in an amount that is effective for inhibiting or decreasing free radical-induced cellular energy depletion; and wherein:

the lignin glycoside has the following properties:

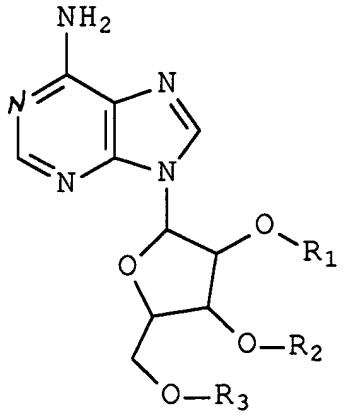
(i) tannin and polysaccharide are bonded;

(ii) the molecular weight is 500 to 140,000;

(iii) the bonding ratio of tannin to polysaccharide is 1:1 to 20:1, as a molecular ratio; and

(iv) the polysaccharide is composed of 60 to 70% uronic acid, and 30 to 40% neutral sugar.

23 A pharmaceutical composition comprising a compound of formula II:



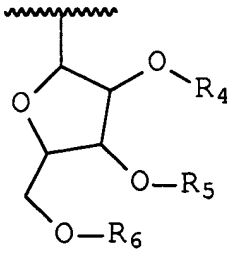
II

or a pharmaceutically acceptable salt, hydrate, ester,

solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

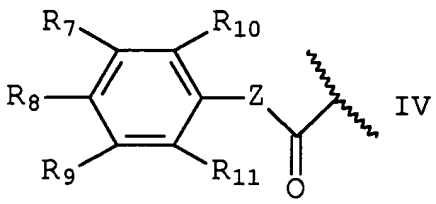
wherein the compound of formula II is present in an amount that is effective for treatment or prevention of diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal muscle, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy, osteoarthritis, osteoporosis, neuropathic pain, nervous insult, peripheral nerve injury, renal failure, retinal ischemia, septic shock, and skin aging; and wherein:

R_1 represents a hydrogen atom, a group represented by formula III:



III

or A, wherein A is the compound of formula IV:



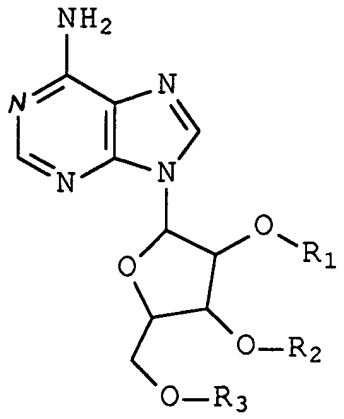
wherein Z is a bond, C_1-C_8 alkyl, or C_2-C_8 alkenyl;

R_7, R_8, R_9, R_{10}, and R_{11} are independently selected from hydrogen, hydroxyl, or C_1-C_8 alkoxy, provided that R_7-R_{11} are not four or five hydrogen atoms simultaneously, and R_2, R_3, R_4, R_5, and R_6 independently represent a hydrogen atom or A, A representing the same as that described above;

provided that R_1, R_2, and R_3 do not represent a hydrogen atom simultaneously; and further provided that R_2, R_3, R_4, R_5, and R_6 do not represent a hydrogen atom simultaneously.

24. The pharmaceutical composition of claim 23, wherein A is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3, 5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

25. A pharmaceutical composition comprising a compound of formula II:



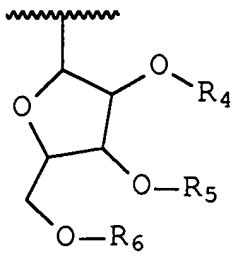
II

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier;

wherein the compound of formula II is present in an amount that is effective for inhibiting or decreasing free radical-induced cellular energy depletion;

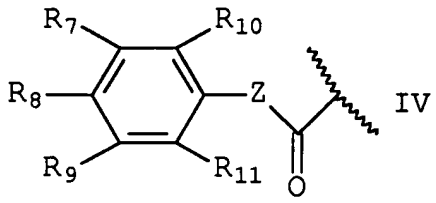
and wherein:

R_1 represents a hydrogen atom, a group represented by formula III:



III

or A, wherein A is the compound of formula IV:



IV

wherein Z is a bond, C_1-C_8 alkyl, or C_2-C_8 alkenyl; R_7, R_8, R_9, R_{10}, and R_{11} are independently selected from hydrogen, hydroxyl, or C_1-C_8 alkoxy, provided that R_7-R_{11} are not four or five hydrogen atoms simultaneously, and R_2, R_3, R_4, R_5, and R_6 independently represent a hydrogen atom or A, A representing the same as that described above;

provided that R_1, R_2, and R_3 do not represent a hydrogen atom simultaneously;

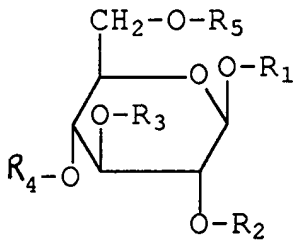
and further provided that R_2, R_3, R_4, R_5, and R_6 do not represent a hydrogen atom simultaneously.

26. A method for inhibiting or decreasing free radical-induced cellular energy depletion comprising administering to an animal a therapeutically effective amount of a PARG inhibitor or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof.

27. A method for inhibiting or preventing free radical-induced cell death or cell damage comprising administering to an animal a therapeutically effective amount of a PARG inhibitor or a pharmaceutically acceptable salt,

hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof.

28. A method for treating or preventing diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal muscle, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy, osteoarthritis, osteoporosis, neuropathic pain, nervous insult, peripheral nerve injury, radiosensitizing of tumor cells, renal failure, retinal ischemia, septic shock, and skin aging; comprising administering to an animal a therapeutically effective amount of a compound of formula I:



I

or a pharmaceutically acceptable salt, hydrate, ester,

solvate, prodrug, metabolite, or stereoisomer thereof;

wherein:

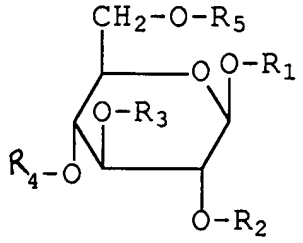
R_1, R_2, R_3, R_4, R_5 individually represent a hydrogen atom or A, A representing a carbonyl having a phenyl substituted by a one or more substituents of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups, provided that R_1-R_5 do not represent a hydrogen atom simultaneously.

29. The method of claim 28, wherein A is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3, 5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

30. The method of claim 28, wherein the compound of formula I is 1,2,3,4,6-Penta-O-Galloyl-D-Glucopyranose, 1,2,3,4,6-Penta-O-(3,5-Dimethoxy-4-Hydroxycinnamoyl)-D-Glucopyranose, or 1,2,3,4,6-Penta-O-(3,4,5-Trimethoxycinnamoyl)-D-Glucopyranose.

31. A method for inhibiting or decreasing free radical-induced cellular energy depletion comprising administering to an animal a therapeutically effective amount of a compound of

formula I:



I

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof; and wherein:

R_1, R_2, R_3, R_4, R_5 individually represent a hydrogen atom or A, A representing a carbonyl having a phenyl substituted by a plurality of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups, provided that R_1-R_5 do not represent a hydrogen atom simultaneously.

32. A method for treating or preventing diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal muscle, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy, osteoarthritis, osteoporosis, neuropathic pain, nervous

insult, peripheral nerve injury, renal failure, retinal ischemia, septic shock, and skin aging; comprising administering to an animal a therapeutically effective amount of a lignin glycoside or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof; wherein:

the lignin glycoside has the following properties:

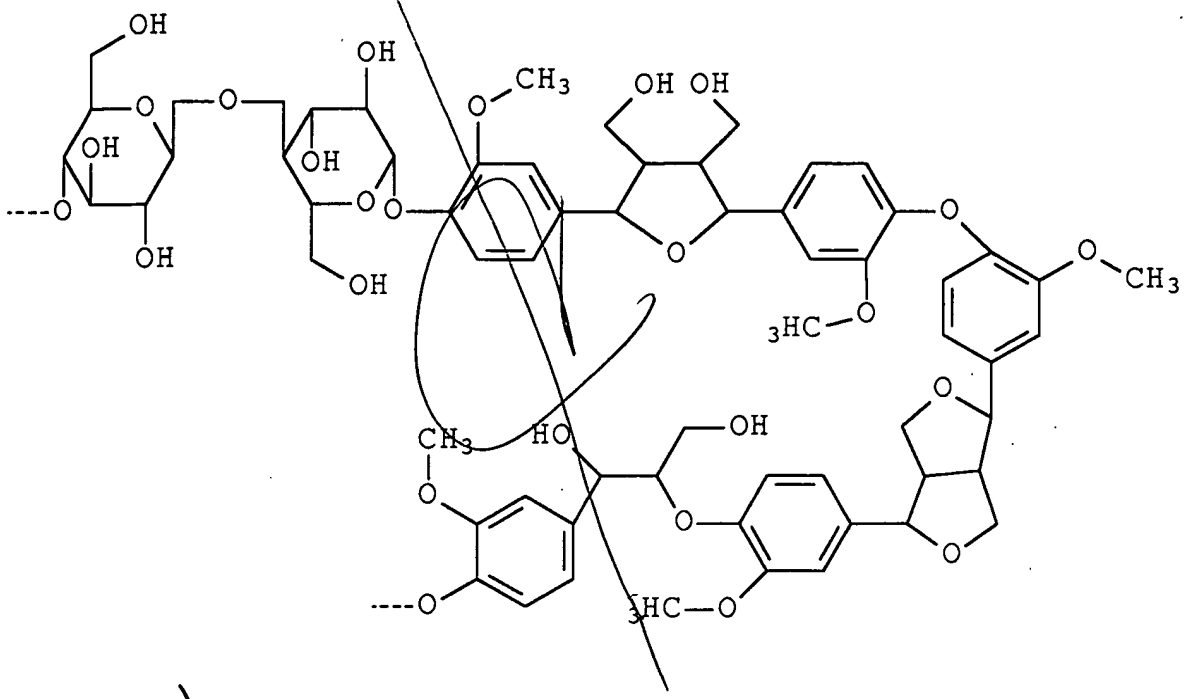
(i) ~~tannin~~ lignin and polysaccharide are bonded;

(ii) the molecular weight is 500 to 140,000;

(iii) the bonding ratio of ~~tannin~~ lignin to polysaccharide is 1:1 to 20:1, as a molecular ratio;

(iv) the polysaccharide is composed of 60 to 70% uronic acid, and 30 to 40% neutral sugar.

38. The pharmaceutical composition of claim 32, wherein the ~~tannin~~ lignin glycoside comprises the following structure:



34. A method for inhibiting or decreasing free radical-induced cellular energy depletion comprising administering to an animal a therapeutically effective amount of a lignin glycoside or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof; wherein:

the lignin glycoside has the following properties:

(i) ~~tannin~~ lignin and polysaccharide are bonded;

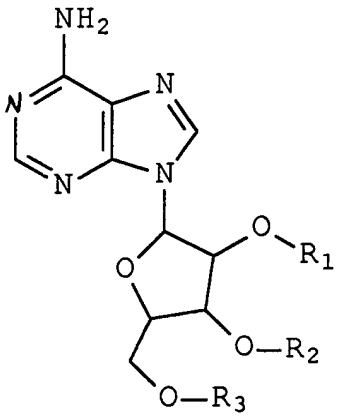
(ii) the molecular weight is 500 to 140,000;

(iii) the bonding ratio of ~~tannin~~ lignin to polysaccharide is 1:1 to 20:1, as a molecular ratio; and

(iv) the polysaccharide is composed of 60 to 70% uronic acid, and 30 to 40% neutral sugar.

35. A method for treating or preventing diseases or conditions selected from the group consisting of tissue damage resulting from cell damage or death due to necrosis or apoptosis, neuronal mediated tissue damage or diseases, neural tissue damage resulting from ischemia and reperfusion injury, neurological disorders and neurodegenerative diseases, vascular stroke, cardiovascular disorders, macular degeneration, arthritis, atherosclerosis, cachexia, degenerative diseases of skeletal muscle, diabetes, head trauma, inflammatory bowel disorders, muscular dystrophy, osteoarthritis, osteoporosis, neuropathic pain, nervous insult, peripheral nerve injury, renal failure, retinal ischemia, septic shock, and skin aging;

comprising administering to an animal a therapeutically effective amount of a compound of formula II:

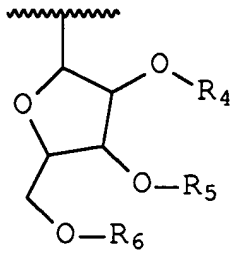


II

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof;

wherein:

R_1 represents a hydrogen atom, a group represented by formula III:



III

or A, A representing a carbonyl having a phenyl substituted by a plurality of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups, and R_2, R_3, R_4, R_5, and R_6 independently represent a hydrogen atom or A, A representing the same as that described above;

provided that R_1, R_2, and R_3 do not represent a hydrogen atom simultaneously; and further provided that R_2, R_3, R_4, R_5, and R_6 do not represent a hydrogen atom simultaneously.

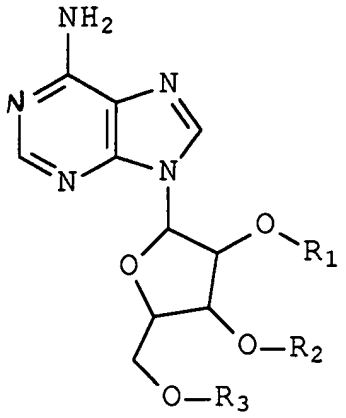
36.

37. The method of claim 36, wherein A is galloyl, 4-hydroxy-3-methoxybenzoyl, 4-hydroxy-3, 5-dimethoxybenzoyl, 3,4,5-trimethoxybenzoyl, 4-hydroxy-3-methoxycinnamoyl, 4-hydroxy-3,5-dimethoxycinnamoyl, 3,4,5-trimethoxycinnamoyl, 3,4,5-trihydroxybenzylcarbonyl or 3,4,5-trihydroxyphenethylcarbonyl.

37.

38. A method for inhibiting or decreasing free radical-induced cellular energy depletion comprising administering to

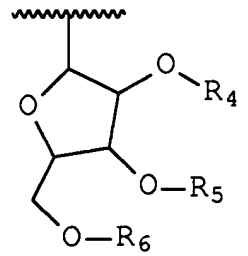
an animal a therapeutically effective amount of a compound of formula II:



II

or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof; wherein:

R_1 represents a hydrogen atom, a group represented by formula III:



III

or A, A representing a carbonyl having a phenyl substituted by a plurality of groups selected from a group consisting of a hydroxyl group and C_1-C_8 alkoxy groups, and R_2, R_3, R_4, R_5, and R_6 independently represent a hydrogen atom or A, A representing the same as that described above; provided that R_1, R_2, and R_3 do not represent a hydrogen atom simultaneously;

and further provided that R_2, R_3, R_4, R_5, and R_6 do not represent a hydrogen atom simultaneously.

A-126

38. ~~39.~~ A pharmaceutical composition comprising a PARG inhibitor or a pharmaceutically acceptable salt, hydrate, ester, solvate, prodrug, metabolite, or stereoisomer thereof, and a pharmaceutically acceptable carrier; wherein the PARG inhibitor is present in an amount that is effective for radiosensitizing tumor cells.

add B3

add C1